

ABSTRACT

PROPORTIONAL MICROMECHANICAL VALVE

The present invention provides a proportional microvalve having a first, second and third layer, and having high aspect ratio geometries. The first layer defines a cavity with inlet and outlet ports. The second layer, doped to have a low resistivity and bonded between the first and third layers, defines a cavity having a flow area to permit fluid flow between the inlet and outlet ports. The second layer further defines an actuatable displaceable member, and one or more thermal actuators for actuating the displaceable member to a position between and including an open and a closed position to permit or occlude fluid flow. The third layer provides one wall of the cavity and provides electrical contacts for electrically heating the thermally expandable actuators. The thermal actuators and the displaceable member have high aspect ratios and are formed by deep reactive ion etching such that they are displaceable in the plane of the second layer while being very stiff out of the plane. Thus, both actuation and displacement of the displaceable member are in the plane of the layer.